

# Species

22(69), 2021

## First report of *Puccinia dichanthii* Afshan and Khalid on three species of *Dichanthium* from India

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### To Cite:

Kamble SK. First report of *Puccinia dichanthii* Afshan and Khalid on three species of *Dichanthium* from India. *Species*, 2021, 22(69), 62-66

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### Peer-Review History

Received: 02 January 2021

Reviewed & Revised: 03/January/2021 to 03/February/2021

Accepted: 04 February 2021

Published: February 2021

### Peer-Review Model

External peer-review was done through double-blind method.



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### ABSTRACT

Three species of *Dichanthium* viz., *D. annulatum* (Forssk.) Stapf, *D. aristatum* (Poir.) C. E. Hubb. and *D. caricum* (L.) A. Camus were found infected with rust disease. The critical microscopic observations and literature investigation leads to the new report of *Puccinia dichanthii* on the said species of *Dichanthium*.

**Key Words:** Rust; *Puccinia dichanthii*; *Dichanthium* spp.; India

### 1. INTRODUCTION

The Poaceae consist of around 785 genera and 10,000 species (Yanis et al. 2010). Nair and Sharmila (2001) presented a critical review on Poaceae in India. Accordingly, Poaceae is the largest family in India representing 1291 species. The genus *Dichanthium* Willem. belongs to Poaceae comprises almost 24 species in India (India Biodiversity Portal 2019).

Rust fungi are highly specialized, obligate plant parasites having exclusive characteristics among all fungal groups. These fungi ordinarily appear as yellow orange or brown powder on a variety of hosts with an estimated 168 rust genera and about 7000 species (Mohanan 2010). The *Puccinia dichanthii* Afshan and Khalid causing rust of *Dichanthium annulatum* was described new to science from Pakistan by Afsan et al. (2010).

In the present research enquiry, *Puccinia dichanthii* causing rust disease on three species of *Dichanthium* is reported new to India.

### 2. MATERIALS AND METHODS

#### Collection of plant material and study site:

The rust infected leaves of *Dichanthium annulatum*, *D. aristatum* and *D. caricum* were collected from Satara district of Maharashtra, India situated at altitude of 578 m showing geographic location- 17°18.48' N latitudes and 74°14.51' E longitudes. The diseased leaves were collected during winter, 2019 and brought to the laboratory of Botany and Plant Protection department, for further investigation. The microphotography was accomplished in Common Facility Centre (CFC) of the college.

**Study of pathogen:**

The leaves with different stages of disease were examined and symptoms noted. The several thin transverse sections passing through pustule has been taken on glass slide. Every section was stained with a dot of cotton blue. The excess stains were removed through blotting paper and mounted with lacto phenol. Afterward, section was covered with cover glass and observed under digital microscope. The fragments of diseased leaves taken and rust pustules were observed. The urediniospores and teliospores were isolated from rust pustules with the help of fine needle and taken on glass slide for observation.

**Disease symptoms:**

Several tiny, yellow-dark brown, powdery rust pustules were noticed on lower surface of leaves. Urediniospores and Teliospores were effortlessly wiped out from the leaves and keenly observed under microscope.

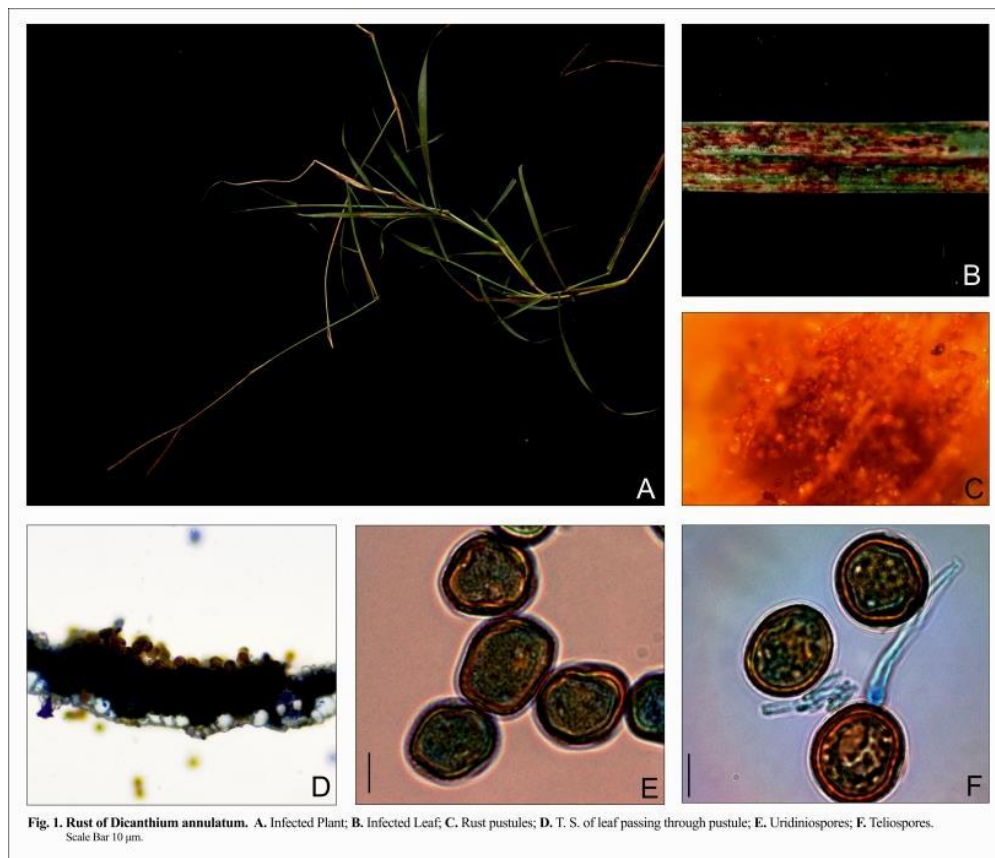
**Microscopic Observations:**

The rust pustules, urediniospores and teliospores were observed by digital microscope (Olympus- CX21iLEDF51). The microphotography was completed through software Magvision equipped with MIPS-3 MP Camera. The software has an inbuilt tool to measure the dimensions of microscopic objects. The diameter of numerous rust pustules, urediniospores and teliospores were measured at different magnifications (10, 40 and 100 X) using mm and  $\mu\text{m}$  scale.

### 3. RESULTS AND DISCUSSION

**Specimens Examined:****1. *Puccinia dichanthii* (Host- *Dichanthium annulatum*)**

Accession No.: AMH- 10142 (Fig. 1).



Pustule are elongated, elliptic mostly hypophyllous, yellow to dark brown, about  $0.31\text{--}1.64 \times 0.18\text{--}0.97$  mm. Urediniospores, cinnamon brown, globose to subglobose to oval in shape up to  $18.71\text{--}27.54 \times 16.91\text{--}24.60$   $\mu\text{m}$ , thick wall, up to  $1.07\text{--}2.20$   $\mu\text{m}$ ,

echinulate, germ pores, 3-5. Teliospores, globose to subglobose to oval, yellowish brown, thick walled up to  $21.07\text{--}21.8 \times 23.97\text{--}26.7 \mu\text{m}$ . Teliospore stalk, hyaline up to  $41.23 \times 3.79 \mu\text{m}$  long.

### 2. *Puccinia dichanthii* (Host- *Dichanthium aristatum*)

Accession No.: AMH- 10141 (Fig. 2).

Pustules are elongated, abaxial, yellow to dark brown, about  $0.13\text{--}0.7 \times 0.19\text{--}1.63 \text{ mm}$ . Urediniospores, yellowish brown, globose to subglobose to oval, angular, olivaceous, subhyaline, unicelled, about  $16.90\text{--}22.63 \times 19.17\text{--}29.86 \mu\text{m}$ , wall, thick and darkened upto  $0.80\text{--}1.68 \mu\text{m}$ , germ pores, 2-5. Teliospores, oval to yellowish brown, wall thick, darkened, up to  $1.2\text{--}7.84 \mu\text{m}$ , minutely roughened, up to  $15.6\text{--}23.7 \times 19.47\text{--}29.21 \mu\text{m}$ . Teliospore stalk, light olivaceous, subhyaline up to  $42.28 \times 1.9 \mu\text{m}$  long.

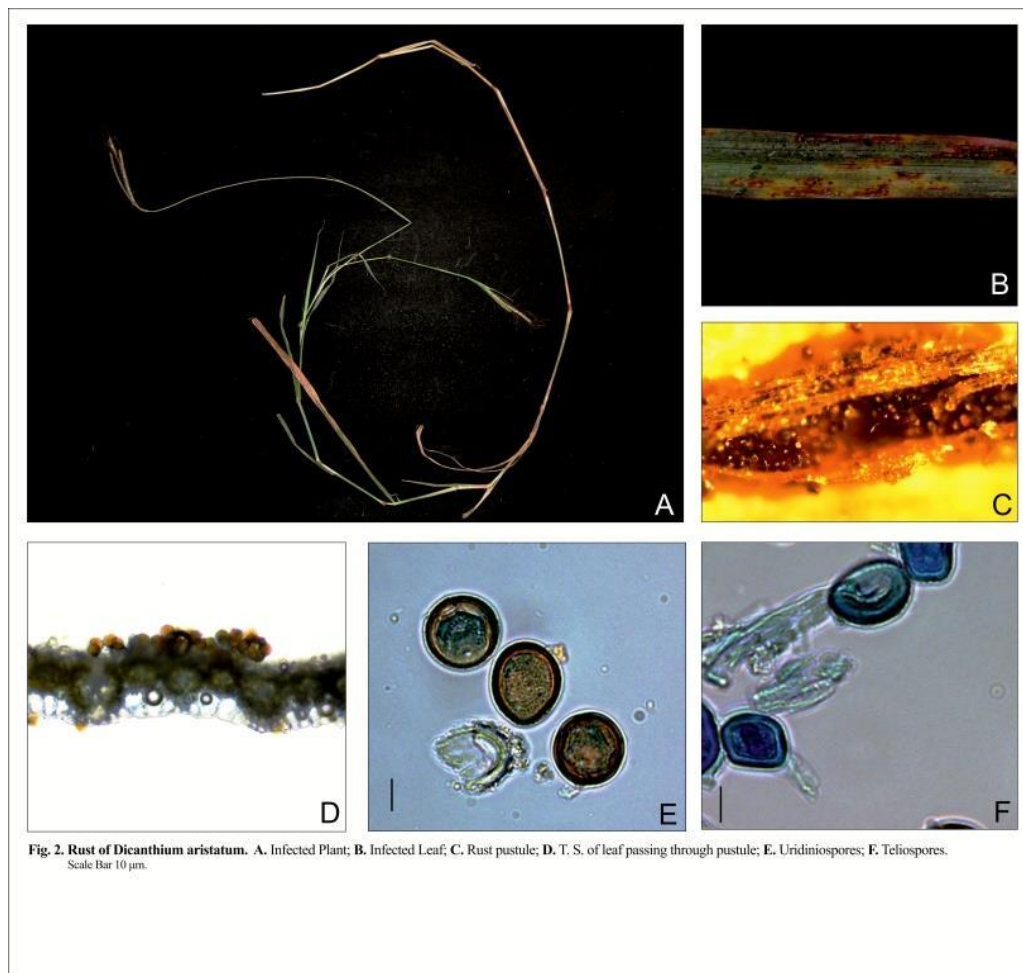


Fig. 2. Rust of *Dichanthium aristatum*. A. Infected Plant; B. Infected Leaf; C. Rust pustule; D. T. S. of leaf passing through pustule; E. Uridiniopores; F. Teliospores. Scale Bar 10  $\mu\text{m}$ .

### 3. *Puccinia dichanthii* (Host- *Dichanthium caricosum*)

Accession No.: AMH- 10143 (Fig. 3).

Pustules are elongated, elliptic on both surface of leaves, yellow to dark brown, about  $0.11\text{--}0.35 \times 0.38\text{--}1.47 \text{ mm}$ . Urediniospores, yellowish brown, globose to subglobose to oval, unicelled,  $16.54\text{--}23.24 \times 22.66\text{--}27.61 \mu\text{m}$ , wall thick and darkened, up to  $0.66\text{--}2.27 \mu\text{m}$ . Teliospores, globose to subglobose to oval, yellowish brown, thick walled, minutely roughened, up to  $17.76\text{--}25.7 \times 23.47\text{--}25.21 \mu\text{m}$ , wall thick, up to  $1.39\text{--}3.21 \mu\text{m}$ . Teliospore Stalk, light, hyaline up to  $35.7 \times 2.7 \mu\text{m}$  long.

Cummins (1971) reported *Puccinia duthiae* Ellis & Tracy Syn. *Puccinia amphiphididis* Doidge and *Puccinia propingua* Syd. & Butl. Syn. *Puccinia andropogonis* Otth. Naturf. on *Dichanthium annulatum* along with *Uromyces clignyi* Pat. & Har. Synonyms-*Uromyces andropogonis-annulati* H. Syd., P. Syd. & Butl., *Uredo anthistiriae* Peteh., *Uredo themedieola* Cumm., *Uromyces triandrae* T. S. Ramak. & Srin. and *Uromyces amphiphididis-inseulptae* T. S. Ramak. & Srin. on *Dichanthium* sp. from India. Recently, Pawar et al. (2018) noted *Puccinia duthiae* on *Dichanthium foveolatum* from India.

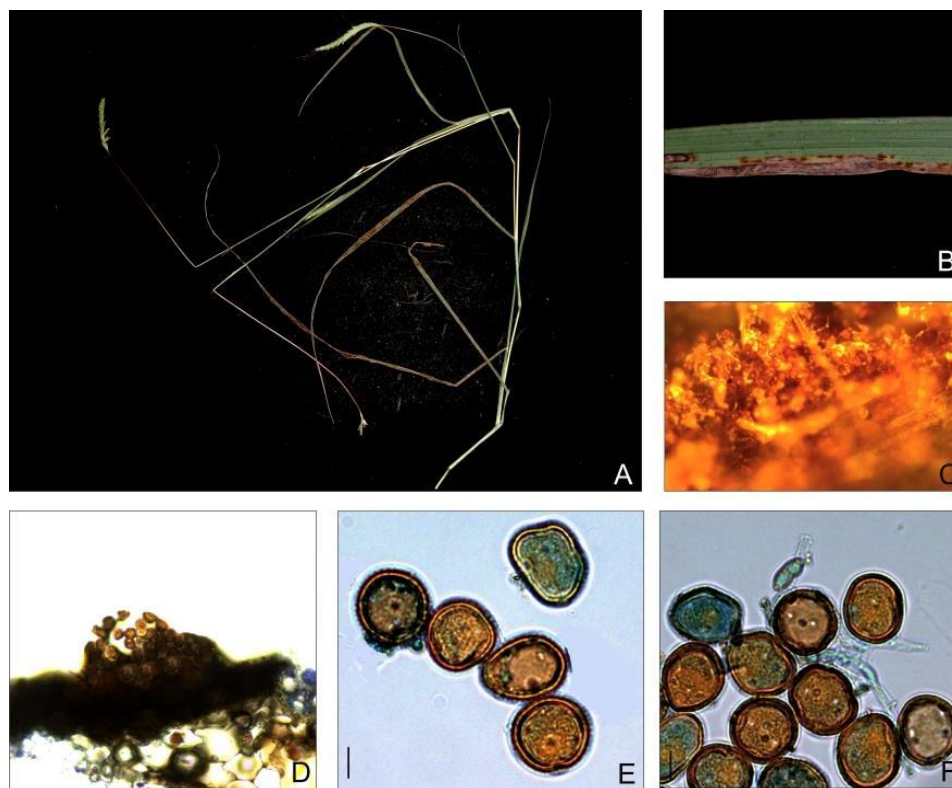


Fig. 3. Rust of *Dichanthium caricosum*. A. Infected Plant; B. Infected Leaf; C. Rust pustule; D. T. S. of leaf passing through pustule; E. Uridiniospores; F. Teliospores. Scale Bar 10  $\mu$ m.

Afshan et al. (2010) described a new species, *Puccinia dichanthii* Afshan and Khalid on *Dichanthium annulatum* from Pakistan. In the present investigation, author undergone critical examination and comparison with previously described fungal specimens in the literature. It was found that, rust fungi on *D. annulatum*, *D. aristatum* and *D. caricosum* resembles with *Puccinia dichanthii* described by Afshan et al. (2010). The insignificant changes were observed in the size of pustules, urediniospores, teliospores and pedicels of *P. dichanthii* on different hosts.

As per best of evidence, *P. dichanthii* was certainly not recorded until now on *D. annulatum*, *D. aristatum* and *D. caricosum* from India. Hence, it makes first report of *P. dichanthii* on these three species of *Dichanthium* in India. The voucher specimens of fungal pathogen on the hosts have been deposited in the Ajrekar Mycological Herbarium at Agharkar Research Institute, Pune (M.S.), India.

#### Acknowledgement

I sincerely thanks to Principal, Dr. M. M. Rajmane, Sadguru Gadage Maharaj College, Karad for providing common facilities. I would like to thank, Dr. G. G. Potdar and Mr. Tarbej Shaikh for their help in identification of *Dichanthium* spp. Also, I wish to express my thanks to Dr. Sachin Thite and Dr. Pavan Hande for their kind suggestions.

#### Conflict of Interest

The authors declare that there are no conflicts of interests.

#### Ethical approval

The ethical guidelines for plants & plant materials are followed in the study for species collection & identification.

#### Funding

This study has not received any external funding.

#### Data and materials availability

All data associated with this study are present in the paper.

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